

## CASE REPORT



# Erosion of urethra by malleable penile prosthesis in a spinal cord injury patient with diabetes mellitus and repeated misplacement of Foley balloon in the urethra: lessons we learn: a case report

Subramanian Vaidyanathan<sup>1</sup>, Bakul Soni<sup>1</sup>, Rauf Khadr<sup>2</sup> and Peter Hughes<sup>3</sup>

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**INTRODUCTION:** Spinal cord injury patients with indwelling urethral catheters are at high risk for erosion of urethra by penile prosthesis. Repeated misplacement of a Foley catheter with the balloon inflated in the urethra produces additional compression, thus predisposing to erosion of urethra by the prosthesis.

**CASE PRESENTATION:** A 22-year male sustained tetraplegia in 1980. He underwent implantation of bladder stimulator, urethral sphincterotomy twice, transurethral resection of bladder neck and then, prostate. In 1991, malleable penile prostheses were implanted to facilitate maintenance of a penile sheath. He required urethral catheter drainage since 1996. The balloon of Foley catheter was misplaced in membranous/bulbar urethra during catheterisations since 2018. In 2020, he developed recurrent penile cellulitis and periurethral abscess resulting in perineal urethro-cutaneous fistula. Cystoscopy showed erosion of urethra at the verumontanum by both prostheses. The prostheses were removed; suprapubic cystostomy was performed.

**CONCLUSION:** Inflation of Foley balloon in the urethra for prolonged periods, aggravated by recurrent cellulitis of penis and diabetes mellitus resulted in urethral erosion by the prostheses. Urethral catheterisations in spinal injury patients, who have undergone sphincterotomy, resection of bladder neck/prostate, should be performed by experienced clinicians to prevent complications of catheterisation. Suprapubic cystostomy, performed earlier, could have averted these adverse events.

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## BACKGROUND

A penile implant has been used in persons with spinal cord injury to enable application and maintenance of penile sheath. Although a patient may be using penile sheath when the prosthesis is implanted, the method of bladder drainage may change over the patient's lifetime. If the patient subsequently requires long-term urethral catheter drainage, such a patient is at risk of urethral erosion by the prosthesis. The erosion of urethra occurs mostly in the region of the fossa navicularis, because of compression of the urethra by the prosthesis and the friction produced by the catheter [1, 2]. Sometimes the balloon of Foley catheter may be inflated in the bulbar/membranous urethra in persons with spinal cord injury, particularly in those who have undergone sphincterotomy, transurethral resection of bladder neck/prostate, when urethral catheterisation is performed by inexperienced clinicians [3]. If the balloon of a Foley catheter is inflated in the bulbar/membranous urethra for a considerable period, the inflated balloon is likely to cause excessive friction and produce additional compression with consequent decrease in blood flow, thus predisposing to erosion of urethra by the prosthesis.

## CASE PRESENTATION

In 1980, a 22-year-old a marine engineer fell down an embankment in Spain and sustained tetraplegia at C-5 level. This patient managed his bladder by reflex voiding, but residual urine of 375 ml necessitated urethral catheter drainage. He underwent cystolitholapaxy in 1981 and in 1982. In March 1982, sacral anterior root stimulator was implanted. In 1987, urethral sphincterotomy was done.

In 1991, this patient underwent cystoscopy, litholapaxy, suprapubic catheterisation and implantation of malleable penile prostheses. The size of the prosthesis was 16 CH and length: 16 cm each side. The suprapubic catheter was removed after the penile wound healed and the patient was established on penile sheath drainage. In 1993, he underwent transurethral resection of bladder neck and electrohydraulic lithotripsy of vesical calculi. In 1994, electrohydraulic lithotripsy of vesical calculi was carried out. Transurethral resection of prostate was performed to release capsular stones. In 1996, the patient was unable to pass urine by activating the sacral stimulator. Flexible cystoscopy showed no mechanical obstruction. A size 14 CH Foley catheter was inserted per urethra. Subsequently, flexible cystoscopy and urethral catheterisations were carried out.

<sup>1</sup>Northwest Regional Spinal Injuries Centre, District General Hospital, Southport PR8 6PN, United Kingdom. <sup>2</sup>Department of Urology, District General Hospital, Southport PR8 6PN, United Kingdom. <sup>3</sup>Department of Radiology, District General Hospital, Southport PR8 6PN, United Kingdom. email: subramanian.vaidyanathan@nhs.net

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**Fig. 1 CT Pelvis.** CT of pelvis (axial section) performed on 28 August 2020 shows the Foley balloon located in the prostatic urethra.

Videourodynamics in 1998 revealed that he generated detrusor pressures of between 50 and 70 cm of water when the sacral stimulator was activated. The bladder neck was wide open all through the filling; there was persistent isolated proximal sphincter spasm during voiding. This patient voided to completion and residual urine was less than 60 ml. In 2000, transurethral sphincterotomy was performed. Immediately after the sphincterotomy, a penile sheath was applied, and the patient could pass urine satisfactorily. However, three weeks later, the patient was not able to pass urine using the stimulator; he developed episodes of autonomic dysreflexia. Therefore, a 14 CH Foley catheter was inserted per urethra.

In 2001, Medtronic SYNCHROMED EL was implanted to provide intrathecal delivery of baclofen to control spasms. In 2006, explant and implant of Medtronic SYNCHROMED II was done.

In 2005, flexible cystoscopy showed contracted, small capacity bladder. This patient was advised to wear a penile sheath and intermittent catheterisations to be performed by carers. However, this patient resided in a residential home where carers were unable to provide intermittent catheterisations over a 24-hour basis. Therefore, this patient had to continue indwelling urinary catheter drainage.

From 2016 onwards, this patient underwent several procedures for removal stones from both kidneys (flexible uretero-renaloscopy, laser lithotripsy). The urethral catheter was being changed by the community nursing team.

In December 2018, this patient did not move his bowels satisfactorily and developed distension of abdomen. CT of abdomen was performed; this CT showed misplacement of Foley balloon in prostatic urethra as an incidental finding. In October 2019, CT KUB was performed to evaluate the renal calculi. This CT also showed misplacement of the balloon of Foley catheter in the urethra.

From July 2020 onwards, this patient developed recurrent episodes of swelling of the penis. Repeated courses of antibiotics were prescribed as the swelling reappeared every time the antibiotics was stopped. In the end of August 2020, the swelling of the penis had subsided, but there was some residual oedema of the prepuce and the shaft of penis. A bead of pus extruded out of the pin hole on the dorsum of penis. Culture of the pus grew *Enterococcus faecalis*, *Citrobacter koseri* and anaerobes. *Citrobacter koseri* was a multi-drug-resistant organism. In view of possible spread of infection to the underlying penile prosthesis, it was decided to treat the anaerobes, *Citrobacter koseri* and presumed infection by Staphylococcus. This patient was prescribed Metronidazole 400 mg every eight hours for seven days and Co-Trimoxazole 960 mg every 12 h for seven days. We explained to the patient that a longer duration of antibiotic therapy might be needed to eradicate infection from the penile prosthesis.

In August 2020, CT of pelvis showed no evidence of gas locules in the penile soft tissues. The implants were present in both corpora cavernosa with no obvious migration of the prostheses. The balloon of the Foley's catheter was present in the prostatic urethra. (Fig. 1) The catheter was changed in the community.



**Fig. 2 CT pelvis.** CT of pelvis (coronal section) done on 24 November 2020 shows the Foley balloon, which has been inflated in the prostatic urethra, is abutting the penile prostheses (located cephalad to the Foley balloon).

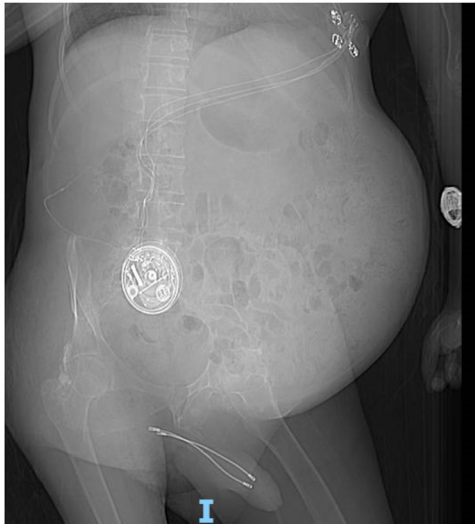
In November 2020, this patient again presented with swelling of the penis. This patient was bypassing the catheter when he sat up on his chair; he would get wet with urine. On clinical examination, there was oedema of the prepuce and distal penile shaft; a longer than usual length of the Foley catheter was found to be lying outside the penis. Misplacement of the Foley catheter was suspected; urgent CT of pelvis was done to assess the location of the balloon of Foley catheter. He was prescribed Flucloxacillin 500 mg every six hours for seven days and Metronidazole 400 mg every eight hours for seven days. Non-Contrast enhanced CT of pelvis, performed on 24 November 2020, revealed the urinary catheter in situ with the balloon inflated in the prostatic urethra and the balloon was abutting the prostheses (Fig. 2). There was no collection around the penile prostheses. The urethral catheter was changed. The patient was referred to a specialist for advice regarding the possibility of infection extending to the penile implants.

HbA1c was 39 mmol/mol in May 2020. With the onset of infection in penis, HbA1c increased to 73 mmol/mol in September 2020, and rose further to 105 mmol/mol in November 2020. He was prescribed Gliclazide 80 mg twice a day, Linagliptin 5 mg daily, and Metformin modified release 1 gram once a day.

In December 2020, the patient continued to get recurring episodes of penile infection despite antibiotics. On clinical examination, there was oedema and redness over the distal half of penile shaft. The prepuce was swollen. On the dorsal aspect of penis, there was a swelling measuring one cm in diameter; fluctuation could be elicited.

CT of urinary tract with contrast was performed on 11 December 2020. The scout film showed the two prostheses in the penis (Fig. 3). CT revealed that the urethral catheter balloon was currently at level of membranous/prostatic part of urethra, rather than within the urinary bladder. There was fluid attenuation collection measuring  $8 \times 1.7 \times 1$  cm (L x W x D), extending from the anterior inferior aspect of symphysis pubis, to between the corpus cavernosus penile implants, up to the perineum (Fig. 4). Gas locules were present within the more cranial aspect of the fluid collection, which indicated secondary infection (Fig. 5). Corpus cavernosus penile implants were in situ, with the distal tip of left implant abutting the skin surface. This CT revealed fluid collection and evolving fistula tracking and draining to the perineum.

The urethral catheter was replaced with flexible cystoscopy. Implant erosion was identified, and the patient was referred to a tertiary centre andrologist. The patient had developed a periurethral abscess, which burst open resulting in urethrocutaneous fistula. There was considerable amount of urine leakage from the fistula. The



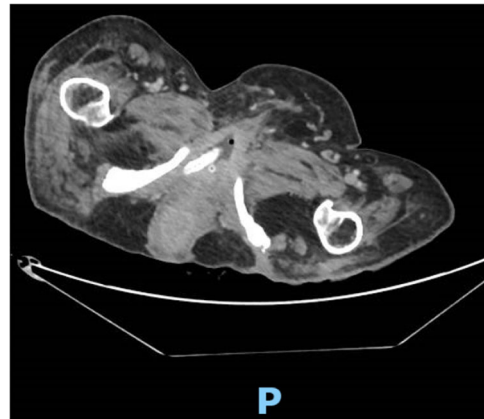
**Fig. 3 Scout film of CT.** Scout film of CT (11 December 2020) shows penile prostheses in situ. The baclofen pump is seen in the centre and the sacral root stimulator at the top right.



**Fig. 4 CT abdomen and pelvis.** CT of abdomen and pelvis (sagittal section) performed on 11 December 2020 shows fluid attenuation collection measuring  $8 \times 1.7 \times 1$  cm (L x W x D), extending from the anterior inferior aspect of symphysis pubis, to between the corpus cavernosus penile implants, up to the perineum. Gas locules were present within the more cranial aspect of the fluid collection.

skin over the perineum and buttocks were moist due to constant urine leakage from the fistula and integrity of the skin was at risk. The patient was then referred to the local spinal injury urology team.

Cystoscopy revealed large posterior false passage in bulbar urethra connecting to perineal wound. Both implants were exposed in the urethra at the verumontanum. Urinary bladder showed chronic reaction to catheter. Suprapubic cystostomy was done. Through a penoscrotal incision, bilateral longitudinal corporotomies were performed. Both prostheses were removed intact. The corpora cavernosa were closed with 3-0 Prolene interrupted sutures. The patient was left with urethral and suprapubic catheters to maximise urine drainage away from the fistula.



**Fig. 5 CTAbdomen and pelvis.** CT of abdomen and pelvis done on 11 December 2020 (axial section) shows fluid collection (containing a gas locule) around the anterior aspect of the penile implant.

The swelling of penile shaft subsided following antibiotics and removal of both corporal implants. The discharge from the perineal fistula gradually decreased over a period of eight months. However, the urine leakage from the fistula persists and is significant when the patient is lying on his bed.

## DISCUSSION

Infection rate of a penile prosthesis in the general population is two per cent [4]. In contrast, the rate of infected prostheses in the spinal cord injury population is seven per cent [5]. This patient developed infection of penile prostheses 29 years after implantation. Diabetes mellitus, phimosis, balanitis, and periurethral abscess arising from urethral false passage contributed to the penile infection spreading to and involving the prostheses in this patient.

Spinal cord injury patients with indwelling urethral catheters are at high risk for erosion of urethra by semi rigid prosthesis. Among the 53 patients, 14 of the 61 semi rigid devices (8 reimplantations) were lost secondary to erosion (23%) [5]. Indwelling urethral catheter and clean intermittent catheterisations cause most of these complications [6]. In nine patients with indwelling urethral catheter or who were using intermittent catheterisation and who had undergone implantation of penile prosthesis, urethral erosion was a late complication and occurred in 56% (five of nine) cases [1]. This patient had urethral catheter drainage for 24 years without a problem. However, misplacement of the Foley catheter and repeated inflation of the Foley balloon in the urethra contributed to erosion of urethra by the prostheses at the level of verumontanum.

An indwelling urethral catheter or urethral instrumentation results in excessive friction and the compression of the urethra results in decreased blood flow to the mucosa. An indwelling urethral catheter predisposes to periurethral bacterial colonisation and produces inflammation; subsequent compromise in the calibre of the urethra enhances the likelihood of friction between the indwelling catheter and the urethra [1]. In this patient, repeated misplacement of the catheter and inflation of the Foley balloon in the urethra together with recurrent infection of penile soft tissue resulted in infection of the prostheses and erosion of urethra at the level of verumontanum. These complications might have been prevented if suprapubic cystostomy had been performed earlier.

## LEARNING POINTS

- Urethral catheterisations in spinal injury patients especially in those with sphincter spasms, previous sphincterotomy or resection of the bladder neck or the prostate, should be

performed by experienced clinicians to prevent complications such as urethral false passage or misplacement of the Foley balloon in the membranous/bulbar urethra.

- In patients in whom the balloon of Foley catheter had been inflated in the urethra, subsequent catheterisations should be performed with cystoscopy and a guide wire to ensure that the Foley catheter is inserted into the bladder.
- When a medical device is implanted in a spinal cord injury patient, the medical team should discuss possible late complications of the implant such as malfunction with the patient. In this patient, the bladder stimulator failed to function, and this required a major change in the method of bladder management.
- When this patient underwent implantation of penile prostheses, he was using the bladder stimulator and a penile sheath. Subsequently, this patient could not empty his bladder with the bladder stimulator because of its malfunctioning. Malfunction of the stimulator necessitated the use of an indwelling urinary catheter. It is crucial to inform patients and document in the notes of possible catheter-related complications of penile prostheses. Awareness of possible erosion of the urethra by penile prostheses when indwelling urethral catheters are used for a long period would have influenced the medical team and the patient to consider other methods of bladder drainage promptly and this mishap of urethral erosion could have been prevented.

#### DATA AVAILABILITY

All relevant clinical data pertaining to this case have been provided. Only the confidential data of the patient such as name, date of birth have been withheld to maintain anonymity of the patient.

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#### COMPETING INTERESTS

The authors declare no competing interests.

#### ADDITIONAL INFORMATION

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1038/s41394-022-00481-2>.

**Correspondence** and requests for materials should be addressed to Subramanian Vaidyanathan.

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